

# Line Haul Tug M/V Klihyam Low-NOx Repower Project



Prepared for: BHP Billiton Cabrillo Port Offshore LNG Terminal

Prepared by: OceanAir Environmental, LLC

Report #: OAE-BHP-03

Date: May 2, 2006

## **MN KLIHYAM REPOWER PROJECT**

### **Background**

BHP Billiton LNG International, Inc. (BHP) is proposing to build a LNG importation terminal located in Federal waters approximately 14 miles off the Coast of Ventura County. The terminal consists of a Floating Storage and Regasification Unit (FSRU) which is used to store and vaporize liquefied natural gas (LNG). LNG delivered from LNG carriers is offloaded to the FSRU, stored until needed and then regasified. Gas is then transported via two parallel 24-inch pipelines to an onshore facility at Ormand Beach near Oxnard in Ventura County. The project location is 2.06 nautical miles from the edge of shipping channel.

BHP has offered to mitigate the proposed project's NOx emissions by funding engine conversions for third party marine vessels operated along the California Coast. This report identifies one of these vessels, the MN Klihyam, and documents the anticipated emission reductions as a result of the engine repowering as well as the areas where the anticipated emission reductions are expected to occur.

### **Proposed Mitigation Project**

#### **Project**

Repower the line haul tug boat M/V Klihyam operated by Sause Brothers, Inc. with low-NOx engines.

#### **MN Klihyam Details**

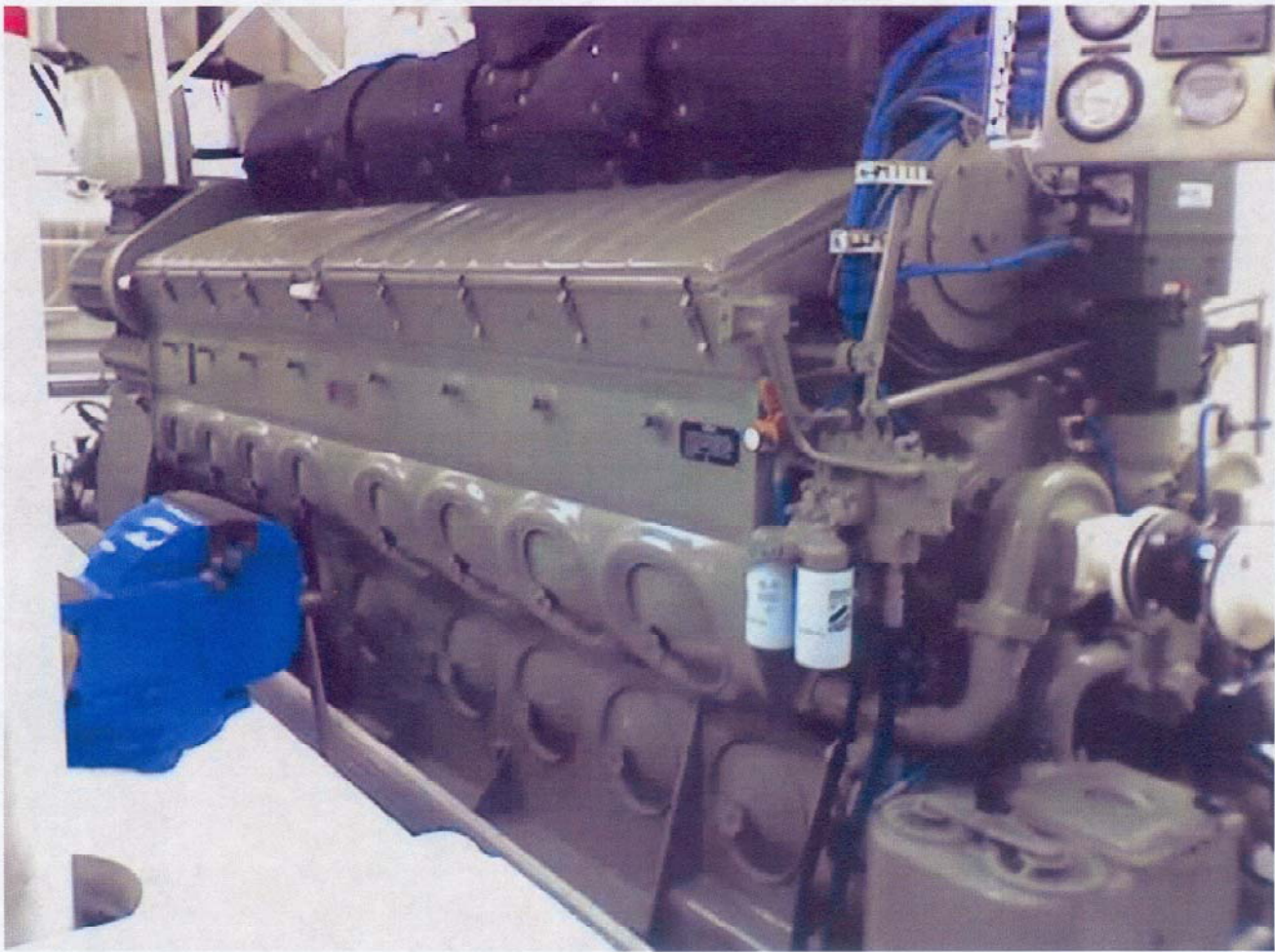
MN Klihyam details are as follows:

Official number	1084928
Gross tonnage	197
Net tonnage	134
Length	114' 9.5"

#### **M/V Klihyam Baseline (i.e., Existing) Engines**

The M/V Klihyam utilizes two engines for propulsion. Both are Electro-Motive Diesel (EMD) 16-645E6 engines which generate 1,950 h.p. at 900 rpm. The model numbers for each engine are stated below:

S/N Port 81-H1-1055, MY 1981  
S/N Starboard 82-M2-1008, MY 1982



### Project Description

Sause Brothers, Inc. uses the line haul tug M/V Klihyam primarily to tow the barge Sunset Bay from Richmond to Los Angeles. References to Los Angeles are intended to also include Long Beach and El Segundo. The vessel also occasionally makes trip into Martinez, Benicia, and San Francisco. Sunset Bay barge hauls petroleum products and is equipped with a vapor recovery system. Sunset Bay generators and engines already comply with USEPA Tier II emission limits.

Sause Brothers took over this line haul run in December 2004 and began operation on December 28, 2004. Prior to Sause operation, the service was being provided by Crowley Maritime. Sause Brothers is using the M/V Klihyam for this operation with a combined total horsepower of 3,900.

### Engine Repower

The engine repower project consists of replacing M/V Klihyam's existing diesel propulsion engines (dual EMD12-645E6 engines) with new low-emissions EMD8-710G7B diesel propulsion engines. The 8-710G7B engines are rated at 2,000 h.p. each at 900 rpm. 8-710G7B engines are electronically controlled while the 12-645E6 engines are mechanically controlled. The electronic controls ensure more precise operation and

lower emissions per brake horsepower-hour (bhp-hr). Additionally 8-710G7B engines are more fuel efficient compared to the existing 12-645E6 engines.

### Emission Reduction Calculations and Documentation

#### a. Historical Operation

M/V Klihyam began operation on December 28, 2004, towing petroleum barge Sunset Bay. Therefore, the evaluation of operating history is limited to this time as the previous route operator's records are not available for inspection. The review consisted of both reviewing the fuel logs and reviewing the trip logs.

The fuel logs document that in 2005 a total of 553,742 gallons of diesel was burned in MN Klihyam. This amount includes 40,000 gallons that was purchased in late December 2004. M/V Klihyam took on 71,000 gallons of fuel on Dec 14, 2004, the majority of which was consumed in January 2005 when the revenue service operation began. OceanAir has conservatively considered only 40,000 gallons out of the 71,000 gallons of fuel to have been burned in January 2005. A summary of the fuel logs is presented in Section D of Attachment A.

The trip logs document that M/V Klihyam took a total of 270 trips. Of this total, 43 were line haul trips (inter-coastal), 144 trips occurred locally within the Los Angeles, El Segundo and Long Beach area, and 83 trips occurred locally within the Richmond, San Francisco, Martinez, Benicia, and Rodeo area. Copies of the actual trip logs are included in Attachment B and a summary of the trip routes, along with distances and trip time, are presented in Section E of Attachment A.

#### b. Emission Reduction Calculation Formula

In order to calculate the emission reductions attributable to the MN Klihyam engine repower, OceanAir utilized the equation memorialized in South Coast AQMD Rule 1631(f). Rule 1631 established a program for the generation of mobile source emission reduction credits (MSERCs) through the repowering of diesel-fueled marine vessels. This rule was the subject of prolonged discussion between US EPA Region 9, South Coast AQMD and various stakeholders. This effort generated a rule that took into account multiple perspectives while ensuring a reasonably conservative means of MSERC calculation. This rule has been approved by EPA as part of the California State Implementation Plan. As a result, Rule 1631 is uniquely appropriate for the calculation of the anticipated emission reductions attributable to this marine engine repower project.

Consistent with Rule 1631, the emission reductions attributable to the repowering of MN Klihyam were quantified using the following equation:

$$ER_{\text{minyam}} = (EF_{\text{base}} - EF_{\text{repower}}) \times ECF \times \text{Fuel Burn} / 454/2000$$

Where:

$EF_{base}$  = Baseline Emission Factor (gms/bhp-hr)  
 $EF_{repower}$  = Repower Emission Factor (gms/bhp-hr)  
ECF = Energy Consumption Factor (bhp-hr/gal)

The basis for each of these variables is explained below.

c. Baseline Emission Factor ( $EF_{base}$ )

The baseline emission factor for NO<sub>x</sub> was taken from 1992 emissions information by EMD, the engine manufacturer, for the 16-645 roots blown engine type. A copy of this specification sheet is included as Attachment C. The PM emission factor was taken from off-road default information for the model year.

d. Repower Emission Factor ( $EF_{repower}$ )

The repower emission factors were based on the Tier 2 emission limits. As documentation of compliance with these limits, OceanAir has included as Attachment D EMD's Certificate of Conformity.

e. Energy Consumption Factor (ECF)

The Energy Consumption Factor was derived from information in the EPA 2006 Model Year Certificate of Conformity. Specifically, the brake specific fuel consumption (bsfc) is identified in the Certificate of Conformity Propeller Cube Curve as 0.314 lb/bhp-hr at 900 rpm. At a fuel density of 7.1 lb/gallon, the ECF calculates to 22.61 bhp-hr/gal. This calculation is shown in Section C of Attachment A.

f. Emission Reduction Calculations

Based on the formula and variables identified above, OceanAir calculated the emission reductions anticipated to result from the repowering of the M/V Klihyam. Details for this calculation are shown in Section C of Attachment A. In total, it is projected that as a result of the MN Klihyam engine repower project NO<sub>x</sub> emissions in California Coastal Waters will be reduced by 138.71 tons per year and that particulate emissions will be reduced by 4.52 tons per year. Emission reductions by segment and by air district are presented in Sections C.1 and C.2 of Attachment A.

**ATTACHMENT A**  
**M/V KLIHYAM**  
**EMISSION REDUCTION SUMMARY**

## ATTACHMENT A

### M/V Kiihyam Emission Reduction Summary

#### A. Trip Logs Summary

Line Haul Distances

SCAQMD Jurisdiction	82	16.87%
VCAPCD Jurisdiction	44	9.05%
SBAPCD Jurisdiction	130	26.75%
SLOAPCD	60	12.35%
MBUAPCD Jurisdiction	100	20.58%
BAAQMD Jurisdiction	70	14.40%
	486	

SCAQMD and BAAQMD miles include the turn into the Port

#### B. Emission Factors

##### Baseline

NOx	15.2 gms/bhp-hr
PM	0.53 gms/bhp-hr
NOx Correction for California fuel	0.94
PM Correction for California fuel	0.8
Corrected NOx	14.288 gms/bhp-hr
Corrected PM	0.424 gms/bhp-hr

Reference: GM EMD Manufacturers Specification

##### Repower

NOx	4.87 gms/bhp-hr
PM	0.107 gms/bhp-hr
NOx Correction for California fuel	0.87
PM Correction for California fuel	0.9
Corrected NOx	4.2369 gms/bhp-hr
Corrected PM	0.0963 gms/bhp-hr

Reference: USEPA Tier 2 Emission Limit

ATTACHMENT A

M/V Kiihyam  
Emission Reduction Summary

C. Emission Reductions

Methodology for calculating emission reductions: SCAQMD Rule 1631 - Pilot Credit Generation Program for Marine Vessels (SIP-approved MSERC calculation method peer reviewed by USEPA)

Emission reductions (tons/yr) =  $(\text{EF}_{\text{base}} - \text{EF}_{\text{repower}}) \times \text{ECF} \times \text{Fuel Burn} / 454 / 2000$   
where ECF = Energy Consumption Factor

EF<sub>Base</sub> = 15.2 gms/bhp-hr  
EF<sub>repower</sub> = 4. gms/bhp-hr  
ECF = 22.61 bhp-hr/gal

Reference: GM EMD Manufacturers Specification  
Reference: USEPA Tier 2 Emission Limit  
Reference: ElectroMotive 8-710 Tier 2 Certificate of Conformity  
22.61 bhp-hr/gal = 1/(0.314 lb/bhp-hr / 7.1 lb/gal) @ 900 RPM

C.1 Emission Reductions by Segment

Line Haul segment

NOx	112.95 tons/yr
PM	3.68 tons/yr

Local Los Angeles/Long Beach/EI Segundo segment

NOx	17.51 tons/yr
PM	0.57 tons/yr

Local San Francisco, Richmond, Martinez segment

NOx	8.25 tons/yr
PM	0.27 tons/yr

Total Emission Reductions NOx

Total Emission Reductions PM

138.71 tons/yr

4.52 tons/yr

# ATTACHMENT A

## M/V Klihyam Emission Reduction Summary

### C.2 Emissions Reductions by Air District

NOx					
	Line Haul Segment tons/yr	Local Segment tons/yr	Total tons/yr	% of All	
SCAQMD	19.06	17.51	36.57	26.36%	
VCACPD	10.23	0.00	10.23	7.37%	
SBAPCD	30.21	0.00	30.21	21.78%	
			77.01		
SLOAPCD	13.94	0.00	13.94	10.05%	
MBUAPCD	23.24	0.00	23.24	16.75%	
BAAQMD	16.27	8.25	24.52	17.68%	
	112.95	25.77	138.71		
PM					
	Line Haul Segment tons/yr	Local Segment tons/yr	Total tons/yr	% of All	
SCAQMD	0.62	0.57	1.19	26.36%	
VCACPD	0.33	0.00	0.33	7.37%	
SBAPCD	0.99	0.00	0.99	21.78%	
SLOAPCD	0.45	0.00	0.45	10.05%	
MBUAPCD	0.76	0.00	0.76	16.75%	
BAAQMD	0.53	0.27	0.80	17.68%	
	3.68	0.84	4.52		

ATTACHMENT A

M/V Kilihyam  
Emission Reduction Summary

D. Fuel Logs

Q1	Fuel, gal	Fuel,gal	Fuel, gal
1/14/2005	39,100	1/10/2006	35,000
2/5/2005	33,000	2/6/2006	48,000
3/7/2005	30,000	2/20/2006	23,500
		3/10/2006	35,500
	102,100		142,000

Q2	Fuel, gal
4/8/2005	35,010
5/8/2005	48,000
6/14/2005	35,100
6/24/2005	29,000
	147,110

Q3	Fuel, gal
8/5/2005	34,000
9/3/2005	38,500
9/22/2005	32,000
	104,500

Q4	Fuel, gal
10/17/2005	43,000
11/17/2005	54,000
12/14/2005	38,000
12/28/2005	25,032
	160,032

Total 2005 513,742  
Vessel began operation on 12-28-04 with 71,000 gallons of fuel onboard  
which was consumed mostly in January 2005. Use Q1 fuel data for baseline 2005

Adjusted Total fuel consumed in 2005 553,742 gallons

# ATTACHMENT A

## M/V Kiliyam Emission Reduction Summary

### E. Trip Logs

#### E.1. Line Haul Trips

From	To	# trips	Hrs	Avg hrs/trip
Richmond	Los Angeles	17	887	52.2
Long Beach	Richmond	5	322	64.4
Richmond	Long Beach	2	98	49.0
Los Angeles	Richmond	8	400	50.0
El Segundo	Richmond	4	194	48.5
Martinez	Richmond	2	92	46.0
Los Angeles	San Francisco	1	40	40.0
Rodeo	Long Beach	1	50	50.0
Long Beach	Martinez	1	56	56.0
El Segundo	Benecia	2	100	50.0
		43	2239	52.1

One trip on 12/16 115 hrs (weather delayed)

#### E.2. Local Los Angeles/Long Beach/El Segundo

# trips	Hrs	Avg hrs/trip
144	451	3.1

#### E.3. Local Richmond, Martinez, Benecia

# trips	Hrs	Avg hrs/trip
83	212.5	2.6

#### E.4. Data Reduction

Total run hours for 2005	2902.5
Total trips for 2005	270
Avg/trip for 2005, hrs/trip	10.8

Service	Engine H.P.	Load Factor	Fuel Consumption gal/hr	Total hrs	Total Fuel Consumed gal	% of total Fuel
Line haul	3,800	0.97	201.4	2,239	450,883	81.42%
Local Los Angeles/El Segundo/Long Beach	2,925	0.75	155.0	451	69,916	12.63%
Local Richmond/Benecia/Martinez	2,925	0.75	155.0	213	32,943	5.95%
				2,903	553,742	

**ATTACHMENT B**  
**M/V KLIHYAM**  
**TRIP LOGS**

TUG: KLIHYAM TOWING BARGE SUNSET BAY

start 12/28/04

to 12/28/04 10:00  
to 12/28/04 10:00

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
Coos Bay	50mar	1215	12/28/04	Richmond	4W B-2	0115	12/31/04
Richmond	4W B-2	0020	01/01/05	Martinez	Shore	1530	01/06/05
Martinez	Shore	2020	01/07	Richmond	Cal-Oil	0040	01/08
Richmond	Cal-Oil	1105	01/08	Richmond	IMTT	1155	01/08
"	IMTT	2055	01/08	Richmond	Shore	2140	01/08
"	Shore	0804	01/09	"	4W-B-2	0945	01/09
"	4W B-2	0315	01/10	Martinez	Shore	1630	01/10
Martinez	Shore	1003	01/11	Richmond	4W B-2	1440	01/11
Richmond	4W-B-2	0935	1/12	Los Angeles	163	1445	1/14
Los Angeles	163	0047	1/15	Los Angeles	189	0130	1/15
"	189	1618	1/15	LA	Anch B2	1745	1/15
"	Anch B2	0125	1/18	LA	238	0255	1/18
LA	238	0030	1/19	El Segundo	#3	0815	1/19
El Segundo	#3	0205	1/20	LA	Anch B-3	0640	1/20
LA	Anch B-3	1020	1/21	Long Beach	Equilon 84	1200	1/21
Long Beach	84	0645	1/23	Richmond	Anch 5	0700	1/25
Richmond	Anch 5	0045	1/26	"	4W B-3	0210	1/26
"	4W B-3	2025	1/26	Martinez	Shore	0040	1/27
Martinez	Shore	1430	1/27	Richmond	Anch 9	1845	1/27
Richmond	Anch 9	1925	1/28	Lightering	SPORADES	2040	1/28
" droplines	SPORADES	2345	1/29	Richmond	4W	0540	1/29
Richmond	4W	2115	1/30	Long Beach	Anch B-5	2120	2/01
Long Beach	Anch B-5	0640	2/02	Long Beach	43	0650	2/02
"	43	0750	2/02	Los Angeles	189	1040	2/02
LA	189	1610	2/04	LA	35	2345	2/04
Long Beach	35	0240	2/06	LA	Anch B2	0300	2/06

Tug KLIHYAN towing barge SUNSET BAY

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
Long Beach	B-2	1045	2/07	Long Beach	84	1200	2/07
"	84	1135	2/08	Richmond	4W	1245	2/10
Richmond	4W	0035	2/11	Benicia	City Dock	0325	2/11
Benicia	City Dock	1745	2/11	"	Valero	1945	2/11
"	Valero	0835	2/12	Martinez	Shell	0945	2/12
Martinez	Shell	0135	2/13	Richmond	IMTT	0615	2/13
Richmond	IMTT	1530	2/13	Richmond	4WB-3	1730	2/13
"	4WB-3	0605	2/15	Los Angeles	189	1520	2/17
Los Angeles	189	2210	2/18	Long Beach	84A	2340	2/18
"	84A	2000	2/18	"	Anch B-2	2115	2/19
Long Beach	Anch B-2	0140	2/23	El Segundo	mooring	0800	2/23
El Segundo	mooring	1320	2/24	Long Beach	Bravo Dock	1900	2/24
Long Beach	Anch B	1000	2/26	LA	189	1230	2/26
LA	189	0800	2/27	LB - Lightering	SPORADES	1025	2/27
Long Beach	B-2	1050	2/28	Long Beach	B-2	1200	2/28
"	B-2	0210	3/03	El Segundo	mooring	1800	3/3
El Segundo	mooring	2215	3/03	Los Angeles	238	0840	3/4
LA	238	0200	3/05	Long Beach	B-2	0430	3/05
LB	B-2 Anch.	0815	3/06	El Segundo	mooring	1250	3/06
El Segundo	mooring	0930	3/07	Los Angeles	189	1735	3/07
LA	189	1910	3/08	Richmond	4W B-2	1200	3/11
Richmond	4W	1822	3/11	Martinez	Shore	2250	3/11
Martinez	Shore	1035	3/12	Richmond	IMTT	1445	3/12
Richmond	IMTT	0420	3/12	Richmond	4WB-3	0630	3/12
"	4WB-3	1827	3/14	Martinez	Shore	2240	3/14
Martinez	Shore	1705	3/15	Avon		1745	3/15

## Tug KLIHYAM towing barge SUNSET BAY

Sheet 1

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
Avon		0455	3/16	Richmond	4W B-3	0930	3/16
Richmond	4W B-3	1125	3/17	"	IMTT	1325	3/17
"	IMTT	0220	3/18	Rodeo	Conoco/And	0600	3/18
Rodeo	Conoco	2235	3/18	Richmond	4W B-2	0130	3/19
Richmond	4W B-2	1430	3/19	Los Angeles	Valero-163	2100	3/21
Los Angeles	163	0905	3/22	"	189 UOPAK	1015	3/22
"	189	0405	3/23	Los Angeles	Arch B-2	1155	3/23
"	Arch B-2	0305	3/24	El Segundo	B-3	1145	3/24
El Segundo	B-3	0640	3/25	LA	189	1250	3/25
LA	189	0850	3/26	El Segundo	B-3	1624	3/26
El Segundo	B-3	0305	3/27	Long Beach	Arch B-3	1000	3/27
LB	Arch B-3	0235	3/28	LB Lightening	SPARADES	0355	3/28
LB	SPARADES	2025	3/28	Los Angeles	163	2215	3/28
Los Angeles	163	0853	3/29	Long Beach	Bravo 3	0955	3/29
LB	Bravo 3	1040	3/29	El Segundo	B-3	0724	3/31
El Segundo	B-3	0020	4/01	Richmond	Arch 5	0540	4/03
Richmond	Arch 5	0830	4/03	Richmond	4W B-2	0950	4/03
"	4W	0450	4/06	Los Angeles	189	1315	4/08
LA	189	0845	4/09	"	163	1000	4/09
"	163	0240	4/10	El Segundo	B-3	0750	4/10
El Segundo	B-3	0435	4/11	Long Beach	Arch B-3	1030	4/11
Long Beach	Arch B-3	1307	4/11	Los Angeles	189	1510	4/11
Los Angeles	189	0102	4/11	"	163	0220	4/12
"	163	0910	4/12	El Segundo	B-3	1553	4/12
El Segundo	B-3	0515	4/13	Los Angeles	189	1130	4/13
Los Angeles	189	0315	4/14	"	163	0445	4/14

## Tug KLIHYAM towing barge SUNSET BAY

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
Los Angeles	1603	1005	4/14	Los Angeles	189	1140	4/14
"	189	0730	4/15	Richmond	4W B-3	0725	4/17
Richmond	4W B-3	0912	4/18	"	IMTT	1045	4/18
"	IMTT	1935	4/18	Martinez	Shore	0230	4/19
Martinez	Shore	1943	4/19	"	Shell	2030	4/19
"	Shell	1600	4/21	Richmond	4W 2	2220	4/21
Richmond	4W B-2	0112	4/24	Martinez	Shore	0535	4/24
Martinez	Shore	2335	4/24	"	Shell	0600	4/25
"	Shell	1635	4/26	Richmond	Anchorage 5	1635	4/26
Richmond	Anch 5	1235	4/27	Richmond	4W 2	1350	4/27
"	4W 2	0100	4/29	Los Angeles	Anch B-5	0150	5/01
Los Angeles	Anch B-5	0730	5/01	"	189	0955	5/01
"	189	1645	5/02	Long Beach	84	1835	5/02
Long Beach	84	1150	5/03	Los Angeles	189	1300	5/03
LA	189	1100	5/04	Long Beach	B-11 Sinus Bay	1330	5/04
Long Beach	Ship 51043	1830	5/04	Long Beach	B-2	1700	5/04
"	B-2	0520	5/06	"	Sygnus Bay	0655	5/06
LB	Sygnus Bay	1130	5/06	Long Beach	Buoy 4	1225	5/06
"	Buoy	0815	5/09	El Segundo	Moorings	1250	5/9
El Segundo	Moorings	1130	5/10	Los Angeles	189	1835	5/10
Los Angeles	189	1310	5/12	Long Beach	B-2	1410	5/12
Long Beach	B-2	0640	5/14	"	86	0820	5/14
"	86	1305	5/15	Los Angeles	189	1600	5/15
Los Angeles	189	0300	5/16	Richmond	Shore	0730	5/18
Richmond	Shore	1750	5/18	"	IMTT	1830	5/18
"	IMTT	2145	5/18	Richmond	4W B-3	2340	5/18

Tug KLIHYAM towing barge SUNSET BAY

Sheet 1

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
RICHMOND	46 B3	2100	5/19	Los Angeles	189	2100	5/21
LOS ANGELES	189	1300	5/22	Long Beach	86	1455	5/22
LONG BEACH	86	1350	5/23	LONG BEACH	ANCHORAGE B-5	1500	5/23
LONG BEACH	ANCHORAGE B-5	1900	5/23	LOS ANGELES	189	2110	5/23
LOS ANGELES	189	1900	5/24	LONG BEACH	ANCHORAGE B-2	2030	5/24
LONG BEACH	ANCHORAGE B-2	0800	5/26	EL SEGUNDO	BERTH 3	1350	5/26
EL SEGUNDO	# 3	0200	5/27	RICHMOND	KANE B	0200	5/29
RICHMOND	KANE B	2055	5/29	RICHMOND	DMT	2135	5/29
RICHMOND	DMT	1020	5/30	RICHMOND	CAL OILS	1110	5/30
RICHMOND	CAL OILS	0600	5/31	RICHMOND	L/W #3	0730	5/31
RICHMOND	L/W #3	1100	6/1	MARTINEZ	SHORE	1800	6/1
MARTINEZ	SHORE	1215	6/2	SAN FRANCISCO	ANCHORAGE #5	1500	6/2
SAN FRANCISCO	ANCHORAGE #5	0520	6/3	RICHMOND	L/W #2	0630	6/3
RICHMOND	L/W #2	0945	6/4	SAN FRANCISCO	ANCHORAGE #5	1150	6/4
SAN FRANCISCO	ANCHORAGE #9	2305	6/4	SAN FRANCISCO	ANCHORAGE #5	0135	6/5
SAN FRANCISCO	ANCHORAGE #5	0300	6/5	RICHMOND	L/W #2	0350	6/5
RICHMOND	L/W #2	0215	6/6	MARTINEZ	SHORE	0720	6/6
MARTINEZ	SHORE	0020	6/7	LONG BEACH	ANCHORAGE B-8	2225	6/8
LONG BEACH	ANCHORAGE B-8	2350	6/8	EL SEGUNDO	# 3	0800	6/9
EL SEGUNDO	# 3	0227	6/10	LONG BEACH	ANCHORAGE B-10	0720	6/10
LONG BEACH	ANCHORAGE B-10	2221	6/10	LOS ANGELES	189	0020	6/11
LOS ANGELES	189	0525	6/12	LONG BEACH	77	0655	6/12
LONG BEACH	77	0233	6/14	LOS ANGELES	189	0340	6/14
LOS ANGELES	189	0255	6/15	EL SEGUNDO	# 3	0805	6/15
EL SEGUNDO	# 3	2355	6/15	LONG BEACH	ANCHORAGE B-2	0810	6/16
LONG BEACH	ANCHORAGE B-2	0300	6/17	LOS ANGELES	163	0430	6/17

## Tug KLIHYAM towing barge SUNSET BAY

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
LOS ANGELES	163	1825	6/17	RICHMOND	L/W #2	1820	6/19
RICHMOND	L/W #2	0840	6/20	BENICIA	VALERO	1140	6/20
BENICIA	VALERO	0910	6/21	MARTINEZ	SHORE	1040	6/21
MARTINEZ	SHORE	0210	6/22	LOS ANGELES	189	2359	6/23
LOS ANGELES	189	2040	6/24	EL SEGUNDO	#3	0750	6/25
EL SEGUNDO	#3	2320	6/25	LONG BEACH	ANCHORAGE B-2	0330	6/26
LONG BEACH	ANCHORAGE B-2	1850	6/27	LONG BEACH	76	2035	6/27
LONG BEACH	76	2245	6/28	EL SEGUNDO	#3	0735	6/29
EL SEGUNDO	#3	0345	7/1	LONG BEACH	ANCHORAGE D-1	0800	7/1
LONG BEACH	ANCH D-1	1040	7/1	LONG BEACH	ANCH D-2 <sup>LIGHTER</sup> <del>SHEP</del>	1205	7/1
LONG BEACH	ANCH D-2	2100	7/2	EL SEGUNDO	#3	0750	7/3
EL SEGUNDO	#3	0125	7/4	LOS ANGELES	187 1/2	0745	7/4
LOS ANGELES	187 1/2	2220	7/4	LONG BEACH	ANCH B-2	2330	7/4
LONG BEACH	ANCH B-2	1625	7/6	LOS ANGELES	163	1815	7/6
LOS ANGELES	163	0820	7/8	LONG BEACH	ANCH B-10	0940	7/8
LONG BEACH	ANCH B-10	1600	7/8	LOS ANGELES	403 <sup>BUNKER</sup> <del>SHEP</del>	1820	7/8
LOS ANGELES	403	0655	7/9	LONG BEACH	ANCH B-5	0830	7/9
LONG BEACH	ANCH B-5	0200	7/15	LOS ANGELES	163	0330	7/15
LOS ANGELES	163	1635	7/15	LOS ANGELES	403 <sup>BUNKER</sup> <del>SHEP</del>	1815	7/15
LOS ANGELES	403	0135	7/16	SAN FRANCISCO	ANCH #5	1745	7/17
SAN FRANCISCO	ANCH #5	1730	7/18	RICHMOND	L/W #2	1815	7/18
RICHMOND	L/W #2	0800	7/20	SAN FRANCISCO	ANCH #9	1000	7/20
SAN FRANCISCO	ANCH #9	0235	7/21	SAN FRANCISCO	ANCH #9 <sup>LIGHTER</sup> <del>SHEP</del>	0415	7/21
SAN FRANCISCO	ANCH #9	1840	7/21	RICHMOND	L/W #3	2100	7/21
RICHMOND	L/W #3	0655	7/23	RODEO	CONOCO PHILLIPS	1025	7/23
RODEO	CONOCO PHILLIPS	2045	7/23	LONG BEACH	ANCH B-3	2300	7/25

## Tug KLIHYAM towing barge SUNSET BAY

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
LONG BEACH	ANCH B-3	2210	7/26	EL SEGUNDO	# 3	0830	7/27
EL SEGUNDO	# 3	0830	7/28	LOS ANGELES	189	1835	7/28
LOS ANGELES	189	2210	7/29	LONG BEACH	ANCH B-2	2345	7/29
LONG BEACH	ANCH B-2	2225	7/31	LONG BEACH	ANCH B-9 LIGHTER SHEEP	2345	7/31
LONG BEACH	ANCH B-9	1405	8/1	LOS ANGELES	163	1600	8/1
LOS ANGELES	163	0400	8/2	EL SEGUNDO	# 3	0900	8/2
EL SEGUNDO	# 3	0110	8/3	LONG BEACH	ANCH B-2	0900	8/3
LONG BEACH	ANCH B-2	1135	8/4	LOS ANGELES	163	1305	8/4
LOS ANGELES	163	2225	8/4	LOS ANGELES	189	0030	8/5
LOS ANGELES	189	1410	8/6	RICHMOND	IMTT	1800	8/8
RICHMOND	IMTT	0745	8/9	RICHMOND	SHORE	0835	8/9
RICHMOND	SHORE	1800	8/9	MARTINEZ	SHORE	2145	8/9
MARTINEZ	SHORE	2245	8/10	RICHMOND	6A	0205	8/11
RICHMOND	6A	2220	8/11	RICHMOND	IMTT	2300	8/11
RICHMOND	IMTT	0740	8/12	SAN FRANCISCO	ANCH #5	0835	8/12
SAN FRANCISCO	ANCH #5	1730	8/12	RICHMOND	L/W #3	1840	8/12
RICHMOND	L/W #3	0025	8/14	RICHMOND	IMTT	0155	8/14
RICHMOND	IMTT	0910	8/14	LOS ANGELES	240 B	0245	8/16
LOS ANGELES	240 B	1640	8/16	LONG BEACH	ANCH B-2	1800	8/16
LONG BEACH	ANCH B-2	1115	8/17	EL SEGUNDO	# 3	0730	8/18
EL SEGUNDO	# 3	1625	8/19	LONG BEACH	ANCH B-3	2005	8/19
LONG BEACH	ANCH B-3	0200	8/22	LOS ANGELES	189	0400	8/22
LOS ANGELES	189	1300	8/23	LONG BEACH	ANCH B-9 LIGHTER SHEEP	1815	8/23
LONG BEACH	ANCH B-9	0035	8/24	LONG BEACH	ANCH B-3	0100	8/24
LONG BEACH	ANCH B-3	1335	8/26	LONG BEACH	ANCH D-6 LIGHTER SHEEP	1635	8/26
LONG BEACH	ANCH D-6	0630	8/27	RICHMOND	KANES	1210	8/29

## Tug KLIHYAM towing barge SONSET BAY

Sheet 1

Port Departed	Berth	Time	Date	Arrival Port	Berth	Secured Time	Sec. Date
RICHMOND	KANEB	2210	8/29	MARTINEZ	KANEB/SHORE	0220	8/30
MARTINEZ	KANEB	1200	8/30	SAN FRANCISCO	ANCH #5	1500	8/30
SAN FRANCISCO	ANCH #5	1645	8/30	RICHMOND	TM TT	1820	8/30
RICHMOND	TM TT	2355	8/30	RICHMOND	L/W #2	0155	8/31
RICHMOND	L/W #2	2315	8/31	LONG BEACH	ANCH B-3	0040	9/3
LONG BEACH	ANCH B-3	1245	9/3	LOS ANGELES	189	1420	9/3
LOS ANGELES	189	0145	9/5	LONG BEACH	76	0335	9/5
LONG BEACH	76	0150	9/6	RICHMOND	KANEB	0955	9/8
RICHMOND	KANEB	2050	9/8	RICHMOND	L/W #2	2210	9/8
RICHMOND	L/W #2	1340	9/10	LOS ANGELES	189	1225	9/12
LOS ANGELES	189	1815	9/13	LOS ANGELES	163	1915	9/13
LOS ANGELES	163	0805	9/14	RICHMOND	L/W #2	0750	9/16
RICHMOND	L/W #2	2000	9/16	RICHMOND	TM TT	2135	9/16
RICHMOND	TM TT	1140	9/17	RICHMOND	L/W #2	1305	9/17
RICHMOND	L/W #2	0100	9/18	LOS ANGELES	163	0425	9/20
LOS ANGELES	163	1738	9/20	LONG BEACH	ANCH B-2	1905	9/20
LONG BEACH	ANCH B-2	1815	9/21	LOS ANGELES	189	2030	9/21
LOS ANGELES	189	2108	9/22	LOS ANGELES	238	2235	9/22
LOS ANGELES	238	1200	9/23	EL SEGUNDO	#3	1630	9/23
EL SEGUNDO	#3	0520	9/24	LONG BEACH	ANCH B-3	1005	9/24
LONG BEACH	ANCH B-3	1520	9/25	LOS ANGELES	163	1645	9/25
LOS ANGELES	163	0505	9/26	LONG BEACH	77	0640	9/26
LONG BEACH	77	1725	9/26	MARTINEZ	KANEB	0125	9/29
MARTINEZ	KANEB	1945	9/29	RICHMOND	TM TT	2320	9/29
RICHMOND	TM TT	0225	9/30	RICHMOND	L/W #2	0355	9/30
RICHMOND	L/W #2	0420	10/1	SAN FRANCISCO	ANCH #5	0450	10/1

130345

[illegible]

# SAUSE BROS.

155 E. Market Ave. \* Coos Bay, OR 96717 \* Phone: (541) 269-5841 \* Fax: (541) 267-8245

## Towage Summary

From 12/28/04 To 03/31/06

Barge 1	Barge 2	Master	From	To	Dep Bort	Dep Date	Departure	Arrival	Arr Bort	Transit	Notes
56 SUNSET B		MILES	RICHMOND	LOS ANGELES	LONGWHARF	10/03/05	2:55	10/05/05	7:30	163	52.6 hrs
56 SUNSET B		MILES	EL SEGUNDO	LOS ANGELES		10/06/05	20:15	10/07/05	5:35	189	6.3 hrs
56 SUNSET B		MILES	LOS ANGELES	EL SEGUNDO	163	10/08/05	1:50	10/08/05	8:00		8.2 hrs
56 SUNSET B		MILES	LOS ANGELES	EL SEGUNDO	189	10/08/05	17:10	10/08/05	17:05		5.9 hrs
56 SUNSET B		MILES	EL SEGUNDO	RICHMOND		10/08/05	17:25	10/11/05	18:25	187	47.0 hrs
57 SUNSET B		MILES	RICHMOND	RICHMOND	SHORE	10/12/05	9:55	10/12/05	10:50	ANCHORAGE 5	0.9 hrs
57 SUNSET B		MILES	RICHMOND	RICHMOND	ANCHORAGE 5	10/13/05	8:00	10/13/05	9:00	LONGWHARF	1.0 hrs
57 SUNSET B		MILES	RICHMOND	LOS ANGELES	LONGWHARF	10/14/05	15:50	10/17/05	22:25	189	78.6 hrs
57 SUNSET		MILES	LOS ANGELES	LONG BEACH	189	10/18/05	8:20	10/18/05	8:00	IRAVO 2 ANCHOR	1.7 hrs
57 SUNSET		MILES	LONG BEACH	LONG BEACH	B2 ANCHOR	10/18/05	19:00	10/18/05	20:07	77	1.1 hrs
57 SUNSET		MILES	LONG BEACH	LONG BEACH	77	10/21/05	2:10	10/21/05	3:00	IRAVO 3 ANCHOR	0.9 hrs
57 SUNSET		MILES	LONG BEACH	EL SEGUNDO	BRAVO 3 ANCHOR	10/21/05	22:30	10/22/05	7:30		9.5 hrs
57 SUNSET B		MILES	EL SEGUNDO	LOS ANGELES		10/24/05	15:40	10/25/05	2:25	189	6.8 hrs
57 SUNSET B		MILES	LA 189	EL SEGUNDO		10/26/05	0:30	10/26/05	7:30		7.0 hrs
57 SUNSET B		MILES	EL SEGUNDO	BENICIA		10/27/05	3:50	10/29/05	6:50	CITY DOCK	51.0 hrs
57 SUNSET B		MILES	BENICIA	BENICIA	CITY DOCK	10/30/05	7:10	10/30/05	8:35	VALERO	1.4 hrs
57 SUNSET B		MILES	RICHMOND	LOS ANGELES	LONGWHARF	11/02/05	0:05	11/04/05	1:20	189	49.3 hrs
57 SUNSET B		MILES	EL SEGUNDO	LONG BEACH		11/05/05	22:50	11/05/05	3:25	IRAVO 2 ANCHOR	4.6 hrs
57 SUNSET B		MILES	LOS ANGELES	EL SEGUNDO	189	11/05/05	9:30	11/05/05	16:40		7.2 hrs
57 SUNSET B		MILES	LONG BEACH	EL SEGUNDO	BRAVO 2 ANCHOR	11/07/05	22:00	11/08/05	7:30		9.5 hrs
57 SUNSET B		MILES	EL SEGUNDO	BENICIA		11/08/05	20:45	11/11/05	0:35	CITY DOCK	48.8 hrs
57 SUNSET B		MILES	BENICIA	MARTINEZ	CITY DOCK	11/12/05	11:00	11/12/05	12:10	SHELL	1.2 hrs
57 SUNSET B		MILES	MARTINEZ	RICHMOND	SHELL	11/13/05	8:00	11/13/05	13:45	LONGWHARF	5.7 hrs
57 SUNSET B		MILES	RICHMOND	LOS ANGELES	LONGWHARF	11/14/05	16:45	11/16/05	16:45	189	51.0 hrs
57 SUNSET B		MILES	LOS ANGELES	EL SEGUNDO	189	11/17/05	10:10	11/17/05	15:00		4.8 hrs
57 SUNSET B		MILES	EL SEGUNDO	LOS ANGELES		11/18/05	2:55	11/18/05	10:00	163	7.1 hrs
57 SUNSET B		MILES	LOS ANGELES	RICHMOND	163	11/18/05	7:00	11/21/05	0:20	LONGWHARF	41.3 hrs
57 SUNSET B		MILES	RICHMOND	LA 189	LONGWHARF	11/21/05	19:35	11/23/05	19:30		47.9 hrs
58 SUNSET B		MILES	LOS ANGELES	EL SEGUNDO	189	11/25/05	19:45	11/25/05	7:00		11.3 hrs

Pick Up Here

# SAUSE BROS.

155 E. Market Ave. \* Coos Bay, OR 96717 \* Phone: (541) 269-5841 \* Fax: (541) 267-8245

## Towage Summary

From: 12/28/04 To: 03/31/06

Boat 1	Boat 2	Master	From	To	Dep. Boat	Dep. Date	Departure	Date Arr	Arrival	Ats. Boat	Towage	Notes
58 SUNSET B		MILES	EL SEGUNDO	RICHMOND		11/29/05	5:15	11/29/05	3:20	IMTT	48.1 hrs	
58 SUNSET B		MILES	RICHMOND	RICHMOND		11/29/05	14:55	11/29/05	18:20	LONGWHARF	1.4 hrs	
58 SUNSET B		MILES	RICHMOND	LOS ANGELES	LONGWHARF		12/03/05	14:20	12/03/05	20:20	189	54.0 hrs
58 SUNSET B		MILES	LOS ANGELES	LOS ANGELES	189	12/03/05	16:15	12/03/05	11:00	ANCHOR	0.8 hrs	
58 SUNSET B		MILES	EL SEGUNDO	LONG BEACH		12/07/05	22:00	12/08/05	4:20	SALISE	6.3 hrs	
58 SUNSET B		MILES	LONG BEACH	EL SEGUNDO	ANCHOR	12/07/05	2:00	12/07/05	6:30		4.5 hrs	
58 SUNSET B		MILES	LONG BEACH	LONG BEACH	SAUSE	12/15/05	11:10	12/15/05	12:40	169	1.5 hrs	
58 SUNSET B		MILES	LONG BEACH	RICHMOND	189	12/16/05	3:20	12/20/05	22:35	longwharf	115.2 hrs	
58 SUNSET B		MILES	RICHMOND	LOS ANGELES	longwharf	12/22/05	10:05	12/25/05	23:30	163	65.4 hrs	
58 SUNSET B		MILES	LOS ANGELES	RICHMOND	163	12/26/05	11:20	12/28/05	12:10	longwharf	48.7 hrs	
58 SUNSET B		MILES	RICHMOND	LOS ANGELES	LONGWHARF	12/28/05	15:30	01/01/06	1:00	189	57.5 hrs	
58 SUNSET B		MILES	LOS ANGELES	LONG BEACH	189	01/02/06	3:00	01/03/06	4:25	86	1.4 hrs	
58 SUNSET B		MILES	LONG BEACH	RICHMOND	86	01/02/06	19:45	01/05/06	16:15	LONGWHARF	68.5 hrs	
58 SUNSET B		MILES	LOS ANGELES	LOS ANGELES	189	01/11/06	9:45	01/11/06	11:15	163	1.5 hrs	
58 SUNSET B		MILES	LOS ANGELES	EL SEGUNDO	163	01/11/06	16:15	01/12/06	7:00		14.7 hrs	
58 SUNSET B		MILES	EL SEGUNDO	LOS ANGELES		01/13/06	6:05	01/13/06	14:25	187	8.3 hrs	
58 SUNSET B		MILES	LOS ANGELES	LONG BEACH	187	01/14/06	3:40	01/14/06	5:05	ANCHORAGE	1.4 hrs	
58 SUNSET B		MILES	LONG BEACH	RICHMOND	anchorage 5	01/15/06	4:05	01/17/06	15:30	LONGWHARF	59.4 hrs	
58 SUNSET B		MILES	RICHMOND	MARTINEZ	longwharf	01/19/06	5:00	01/19/06	7:15	shore	2.3 hrs	
58 SUNSET B		MILES	MARTINEZ	RICHMOND	shore	01/20/06	5:00	01/20/06	6:50	longwharf	1.8 hrs	
58 SUNSET B		MILES	RICHMOND	LOS ANGELES	longwharf	01/21/06	23:20	01/24/06	2:15	163	50.8 hrs	
58 SUNSET B		MILES	LOS ANGELES	LOS ANGELES	163	01/24/06	11:40	01/24/06	13:10	189	1.5 hrs	
58 SUNSET B		MILES	LOS ANGELES	el segundo	189	01/25/06	10:00	01/25/06	15:45		5.8 hrs	
58 SUNSET B		MILES	EL SEGUNDO	RICHMOND		01/25/06	13:45	01/28/06	14:30	IMTT	48.8 hrs	
58 SUNSET B		MILES	RICHMOND	RICHMOND	and	01/28/06	22:50	01/29/06	0:15	anchorage 5	1.4 hrs	
58 SUNSET B		MILES	RICHMOND	RICHMOND	anchorage 5	01/29/06	6:45	01/29/06	7:35	longwharf	0.8 hrs	
58 SUNSET B		MILES	RICHMOND	RICHMOND	LONGWHARF	01/30/06	16:50	01/30/06	20:15	ANCHORAGE	1.4 hrs	
58 SUNSET B		MILES	RICHMOND	RICHMOND	ANCHORAGE 5	01/31/06	14:30	01/31/06	17:30	IMTT	3.0 hrs	
58 SUNSET B		MILES	RICHMOND	RICHMOND	init	02/01/06	7:00	02/01/06	8:00	LONGWHARF	1.0 hrs	
58 SUNSET B		MILES	RICHMOND	LOS ANGELES	longwharf	02/02/06	22:35	02/02/06	1:25	189	50.8 hrs	

Thursday, April 13, 2006

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# SAUSE BROS.

155 E. Market Ave. \* Coos Bay, OR 96717 \* Phone: (541) 269-5841 \* Fax: (541) 267-8245

## Towage Summary

From 12/28/04 To 03/31/06

Barge 1	Barge 2	Master	From	To	Dep Barge	Dep Date	Departure	Arrival	Arr Barge	Transit	Notes
61 SUNSET BA		LIVINGSTONE	LONG BEACH	EL SEGUNDO	BRavo 3 ANCHOR	03/28/06	10:00	13:00	CHEVRON	3.0 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		MINER	LONG BEACH	EL SEGUNDO	BRavo 3 ANCHOR	03/28/06	10:00	13:00	CHEVRON	3.0 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		LIVINGSTONE	EL SEGUNDO	LOS ANGELES	CHEVRON	03/29/06	6:00	14:00	163	8.0 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		MINER	EL SEGUNDO	LOS ANGELES	CHEVRON	03/29/06	6:00	14:00	163	8.0 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		LIVINGSTONE	LOS ANGELES	LOS ANGELES	163	03/30/06	7:00	8:00	189	1.0 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		MINER	LOS ANGELES	LOS ANGELES	163	03/30/06	7:00	8:00	189	1.0 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		LIVINGSTONE	LOS ANGELES	LONG BEACH	189	03/31/06	6:00	9:30	ANCH B3	3.5 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA
61 SUNSET BA		MINER	LOS ANGELES	LONG BEACH	189	03/31/06	6:00	9:30	ANCH B3	3.5 hrs	George dept. 0800 NB to PDX to LA - depts 0850 PDX to LA

### TOWING LOG HAWAII

50 HAWA	RICKEY	LONGVIEW	HONOLULU	WYCO	01/18/05	12:45	02:55/05	10:00	BARGE HARBOR	429.2 hrs	
60 COLUMBIA	LOTT	GENCIA	MARTINEZ	CITY DOCK	02/18/05	13:50	02:18/05	14:40	SHELL	8760.8 hrs	
50 HAWA	CASSEE	HONOLULU	HILLO	BARGE HARBOR	05/08/05	11:55	05/08/05	21:00	PORT DOCK	33.7 hrs	
50 HAWA	CASSEE	HILLO	COOS BAY	PORT DOCK	05/08/05	8:20	05/18/05	23:59	COOS BAY DOCK	284.6 hrs	
50 NEHALEM	BRESSINCK	COOS BAY	SAN DIEGO	CAPE ARAGO	05/18/05	16:50	05/24/05	20:00	24TH ST. B-11	123.2 hrs	
50 NEHALEM	BRESSINCK	SAN DIEGO	LONG BEACH	24TH ST. B-11	05/25/05	21:00	05/26/05	8:00	8-122	12.0 hrs	
50 NEHALEM	BRESSINCK	LONG BEACH	COOS BAY	B-122	05/26/05	20:00	06/04/05	17:30	CAPE ARAGO	165.5 hrs	
51 NEHALEM	LOTT	LONG BEACH	SAN DIEGO		10/02/05	14:20	10/03/05	4:35		14.3 hrs	
51 NEHALEM	HANALEI 51	LONG BEACH	COOS BAY		10/06/05	14:48	10/12/05	18:00		148.2 hrs	
51 NEHALEM	HANALEI 51	COOS BAY	LONG BEACH		10/18/05	11:00	10/24/05	21:00		136.0 hrs	
51 HANALEI	LOTT	LONG BEACH	SAN DIEGO		10/25/05	0:01	10/25/05	14:50		14.8 hrs	
51 HANALEI	LOTT	SAN DIEGO	LONG BEACH		10/28/05	14:00	10/27/05	8:00		18.0 hrs	
51 HANALEI	LOTT	LONGVIEW	ASTORIA		11/03/05	8:00	11/03/05	13:00		4.0 hrs	
51 HANALEI	LOTT	ASTORIA	BERDIEEN		11/06/05	13:00	11/06/05	17:36		6.6 hrs	
51 NEHALEM	LOTT	LONG BEACH	SAN DIEGO		11/16/05	7:00	11/16/05	22:25		15.4 hrs	
51 NEHALEM	LOTT	SAN DIEGO	LONG BEACH		11/17/05	25:00	11/18/05	12:30		13.5 hrs	
51 HALEWA	NEHALEM 51	COOS BAY	ASTORIA		11/22/05	18:55	11/24/05	20:35		27.7 hrs	

Thursday, April 13, 2006

# SAUSE BROS.

155 E. Market Ave. \* Coos Bay, OR 96717 \* Phone: (541) 269-5841 \* Fax: (541) 267-8245

# Towage Summary

From 12/28/04 To 03/31/06

Barge 1	Barge 2	Master	From	To	Dep Bt	Dep Date	Departure	Dest Arr	Arrival	Arr Bt	Transit	Notes
60	SUNSET B	MILES	LOS ANGELES	LOS ANGELES	189	02/06/06	8:00	02/06/06	7:30	183	1.5 hrs	
60	SUNSET B	MILES	LOS ANGELES	EL SEGUNDO	183	02/06/06	22:00	02/07/06	8:15		10.3 hrs	
60	SUNSET B	MILES	EL SEGUNDO	RICHMOND		02/08/06	1:15	02/10/06	0:15	LONGWHARF	47.0 hrs	
60	SUNSET B	MILES	RICHMOND	LOS ANGELES	LONGWHARF	02/12/06	22:05	02/14/06	23:40	153	48.6 hrs	
61	SUNSET B	MILES	LOS ANGELES	LOS ANGELES	153	02/15/06	11:00	02/15/06	11:45	183	0.8 hrs	
61	SUNSET B	MILES	LOS ANGELES	LOS ANGELES	163	02/15/06	20:45	02/15/06	21:45	189	1.0 hrs	
61	SUNSET B	MILES	LOS ANGELES	LONG BEACH	189	02/16/06	21:00	02/16/06	22:15	41	1.3 hrs	
61	SUNSET B	MILES	LONG BEACH	el segundo	41	02/17/06	22:00	02/18/06	8:45		8.8 hrs	
61	SUNSET B	MILES	el segundo	LONG BEACH		02/19/06	7:40	02/19/06	11:55	anchorage 3	4.3 hrs	
61	SUNSET B	MILES	LONG BEACH	LOS ANGELES	anch b3	02/20/06	2:35	02/20/06	4:20	188	1.7 hrs	
61	SUNSET B	MILES	LOS ANGELES	el segundo	189	02/21/06	7:00	02/21/06	14:40		7.7 hrs	
61	SUNSET B	MILES	el segundo	RICHMOND		02/23/06	11:15	02/24/06	10:15	longwharf	23.0 hrs	
61	SUNSET B	MILES	RICHMOND	LOS ANGELES	ANCHORAGE 5	02/28/06	9:00	03/02/06	9:15	189	48.2 hrs	
61	SUNSET B	MILES	LONG BEACH	EL SEGUNDO	BRAVO 3 ANCHOR	03/03/06	9:30	03/03/06	13:00		3.5 hrs	
61	SUNSET B	MILES	LOS ANGELES	LONG BEACH	189	03/09/06	5:00	03/03/06	6:50	BRAVO 3 ANCHOR	1.8 hrs	
61	SUNSET B	MILES	EL SEGUNDO	LOS ANGELES		03/04/06	6:15	03/04/06	9:45	163	3.5 hrs	
61	SUNSET B	MILES	LOS ANGELES	RICHMOND	183	03/05/06	1:15	03/06/06	21:40	LONGWHARF	44.4 hrs	
61	SUNSET B	MILES	RICHMOND	LOS ANGELES	LONGWHARF	03/08/06	1:45	03/09/06	4:45	163	51.5 hrs	
61	SUNSET B	MILES	LOS ANGELES	LOS ANGELES	163	03/10/06	17:00	03/10/06	18:00	188	1.0 hrs	
61	SUNSET B	MILES	LOS ANGELES	LONG BEACH	189	03/11/06	20:00	03/11/06	22:25	B 11 ANCHOR	2.4 hrs	
61	SUNSET B	MILES	LONG BEACH	RICHMOND	B 11 ANCHORAGE	03/12/06	13:30	03/15/06	1:45	IMTT	80.2 hrs	
61	SUNSET B	MILES	RICHMOND	RICHMOND	DATT	03/15/06	18:45	03/15/06	19:45	CASTROL	1.0 hrs	
61	SUNSET B	MILES	RICHMOND	MARTINEZ	CASTROL	03/16/06	22:30	03/17/06	4:50	SHORE	8.3 hrs	
61	SUNSET B	MILES	MARTINEZ	RICHMOND	SHORE	03/18/06	3:35	03/18/06	5:00	ANCHORAGE 22	1.4 hrs	
61	SUNSET B	MILES	RICHMOND	RICHMOND	ANCHORAGE 22	03/18/06	14:00	03/18/06	17:15	LONGWHARF B2	3.2 hrs	
61	SUNSET B	MINER	RICHMOND	LOS ANGELES	longwharf	03/23/06	12:30	03/22/06	20:30	189	56.0 hrs	
61	SUNSET B	MINER	LOS ANGELES	el segundo	188	03/23/06	10:00	03/23/06	16:18	CHEVRON	6.3 hrs	
61	SUNSET B	MINER	el segundo	LOS ANGELES	CHEVRON	03/24/06	12:00	03/24/06	17:25	188	5.4 hrs	
61	SUNSET B	MINER	LOS ANGELES	LOS ANGELES	189	03/25/06	10:15	03/25/06	11:00	183	0.8 hrs	
61	SUNSET B	MINER	LOS ANGELES	LONG BEACH	163	03/25/06	15:45	03/25/06	21:30	AVO 3 ANCHORA	1.8 hrs	

**ATTACHMENT C**  
**ELECTRO-MOTIVE DIESEL**  
**EMISSIONS DATA SHEET**

(b)

GS-02-99 10:10  
EMD 2ND FLR SALESVALLEY DETROIT SAN DIEGO - 8056474104  
TEL: 1-708-387-5845

Feb 14, 92 10:52 No.006 P.O

EMD ENGINE

ELECTRO-MOTIVELaGrange, Illinois 60526  
New Fax Number: 708/387-5845  
Location: Sales Dept. - 2nd Floor (West End)TELEFAX COMMUNICATIONS

DATE: 2/14/92 TIME: 10:30 AM  
TO: Valley Detroit Diesel FROM: J. W. Sebeck  
El Cajon, CA EMD-Power Products  
ATTN: John Wilkie  
FAX: 619/447-8556 FAX: 708/387-5845

=====

Following this cover page, there will be 1 page(s)  
transmitted (SEE MESSAGE BELOW). If problems occur in  
transmission or all pages are not received, please contact  
us at 708/387-8641.

=====

SUBJECT: VDDA/Crowley Maritime  
Request for Exhaust Emissions

REF: 2/12/92 Fax from Ed Schlueter

In accordance with the referenced telefax, the  
following emissions data shall pertain: (Gross/BHP-HR.)

Engine	BHP	NOX	CO	CH2	*SO2
20-645E5	3600	12.32	.77	.42	.82
16-645E5	2875	12.4	.90	.29	.72
12-645E5	2150	13.2	.81	.37	.84
8-645E5	1450	12.36	.72	.31	.87
16-645E2	1950	15.2	2.69	.59	.91
12-645E2	1500	16.0	1.20	.40	.90
8-645E2	1050	17.15	2.10	.40	.90

\* Based upon fuel averaging .25% sulfur

A description of the emissions instrumentation is attached.

  
Jeff Sebeck  
Power Products Sales

**ATTACHMENT D**  
**ELECTRO-MOTIVE DIESEL**  
**TIER 2 CERTIFICATE OF CONFORMITY**

# **ELECTRO-MOTIVE.**

9301 West 55<sup>th</sup> Street  
LaGrange, IL 60525 USA

Tel: 708.387.5884  
Mobile: 708.710.1490  
Fax: 708.387.5845  
robert.e.spicer@emdiesels.com

## **US EPA ISSUES MARINE TIER 2 CERTIFICATE OF CONFORMITY applicable to EMD SERIES 710G7C-T2 ENGINE FAMILY**

Electro-Motive Diesel, Inc. (EMD) is pleased to announce the United States Environmental Protection Agency (US EPA) has issued a 2006 Model Year Tier 2 emissions Certificate of Conformity to EMD for our Series 710G7C-T2 family of diesel marine engines in accordance with the standards of 40 CFR 94.

The US EPA Marine Tier 2 Certificate of Conformity applies to

- EMD Series 710G7C-T2 Engine Family, including:

8-cylinder	2000 BHP	@ 900 RPM
12-cylinder	3000 BHP	@ 900 RPM
16-cylinder	4000 BHP	@ 900 RPM
20-cylinder	5000 BHP	@ 900 RPM

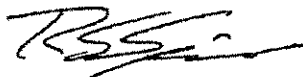
(All rating shown above are Continuous with 10% overload available)

- Duty Cycles for the complete 710G7C-T2 Engine Family, including:
  - Table B-1 (IMO E3) Variable Speed Fixed-Pitch Prop @900 RPM
  - Table B-2 (IMO E2) Constant Speed Propulsion @900 RPM
  - Table B-3 (IMO C1) Variable Speed Variable-Pitch Prop @900 RPM
  - Table B-1 (IMO E3) Variable Speed Fixed-Pitch Prop @800 RPM

The EMD Series 710G7C-T2 Family of engines meet the not-to-exceed (NTE) zone requirements of 40 CFR 94.8(e) when operated under all conditions which may reasonably be expected to be encountered in normal operation and use.

A copy of the US EPA Certificate of Conformity is enclosed for reference.

Please contact the writer with any questions regarding this subject.

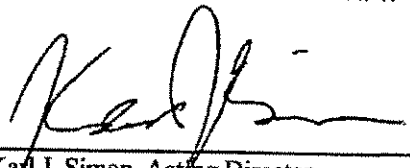


Robert E. Spicer  
Business Manager  
Power Products

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, DC 20460

2006 Model Year Certificate of Conformity

Manufacturer: **ELECTRO-MOTIVE DIESEL, INC.**  
Marine Diesel Engine Family: **6EMDM0710GT2**  
Certificate Number: **EMD-MCI-06-04**  
THC+NOx FEL: **N/A**  
PM FEL: **N/A**  
Date Issued: **APR 19 2006**

  
Karl J. Simon, Acting Director  
Compliance and Innovative Strategies Division  
Office of Transportation and Air Quality

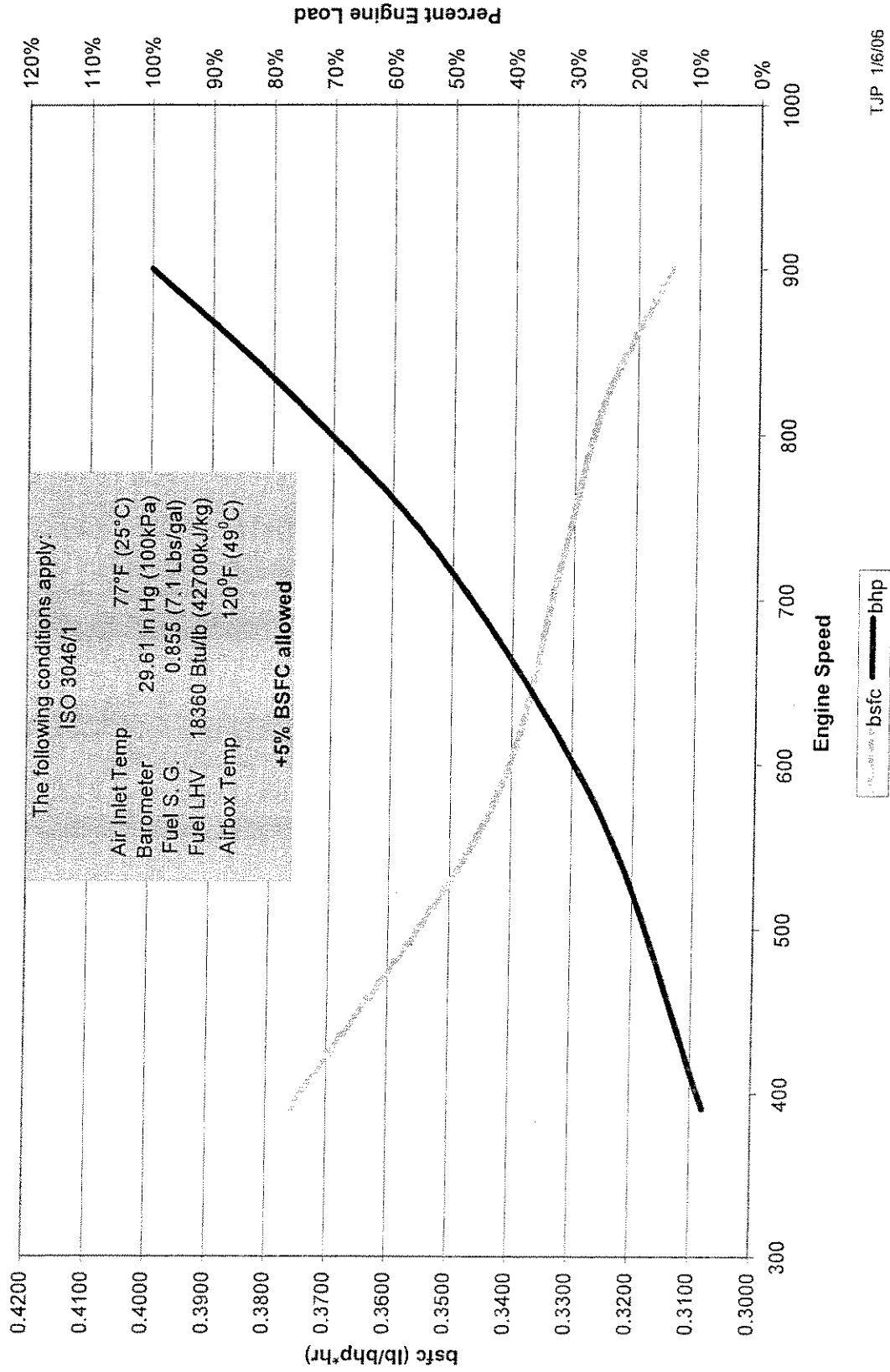
Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR 94, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following marine engines, by engine family, more fully described in the documentation required by 40 CFR Part 94 and produced in the stated model year. This certificate of conformity covers only those new marine compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 94 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 94. This certificate of conformity does not cover marine engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 94.215 and 94.504 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 94. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 94.

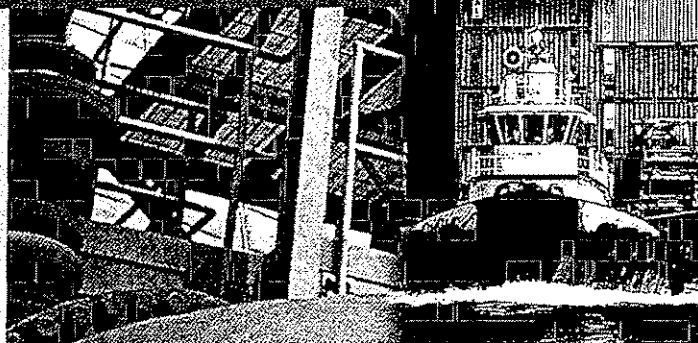
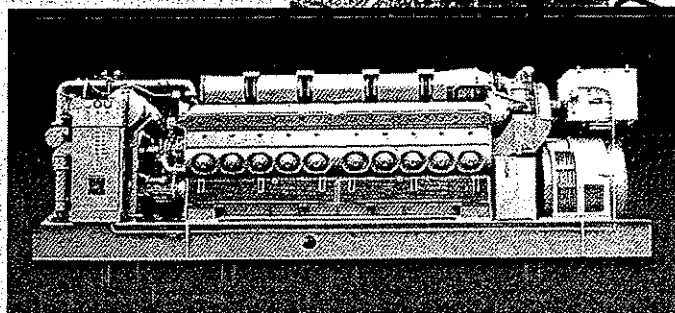
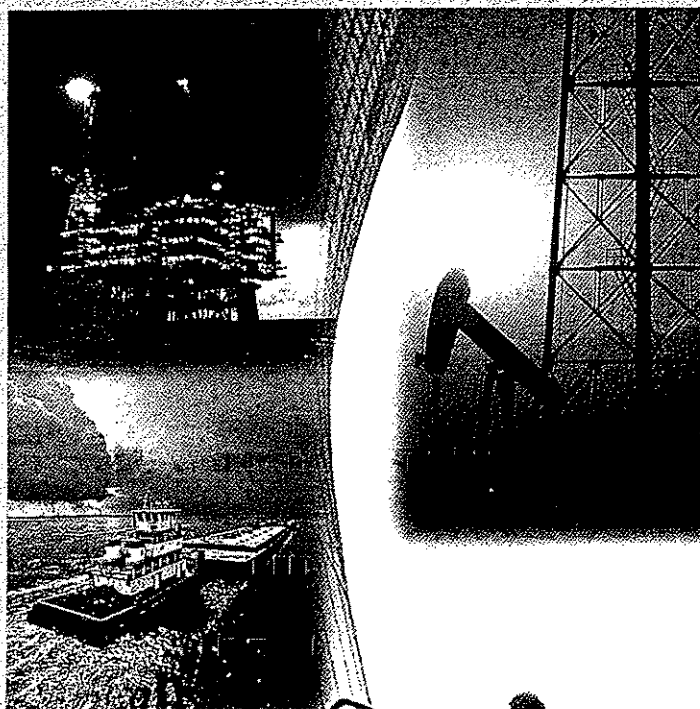
This certificate does not cover marine engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

# ELECTRO-MOTIVE

8-710G7C-T2 Engine  
2000 BHP @ 900 RPM Rating  
US EPA Marine Tier 2 Emissions Compliant  
Propeller Cube Curve  
ISO 3046/1



**ATTACHMENT E**  
**ELECTRO-MOTIVE DIESEL**  
**645 AND 710 SERIES DIESEL ENGINE SPECIFICATIONS**



- Marine Propulsion
- Electric Generating Plants
- Industrial Power Units
- Offshore Well Drilling
- Power Shovel and Dragline Applications
- Land Drilling Rigs
- Dredging

EMD Power Products



# GM/EMD Diesel Engines

800-5000 HP

Wide Power  
Applications

Electro-Motive Division (EMD) of General Motors Corp. produces diesel power for marine propulsion, offshore and land based oil well drilling rigs, stationary power generation and railroad locomotives.

The GM/EMD line of engines is available in 8-, 12- and 16-cylinder roots blown and 8-, 12-, 16- and 20-cylinder turbocharged models. The horsepower ranges from 800 to 5000.

More than half a century of engine design experience has made Electro-Motive a leader in the development of diesel motive power. Electro-Motive is the only diesel engine manufacturer of its size to have produced more than 65,000 engines. This success stems from product reliability, service ability, load acceptance capability, low operating costs and ease of maintenance with standardized components.

## General Data — Common to both 645 and 710 Series Diesel Engines

Type	2 cycle—45° Vee
Crankcase and oil pan construction	Welded steel
Cylinder air inlet	Ports in cylinder liner
Exhaust	Four valves in cylinder head
Piston cooling	Oil-direct pressure stream
Main bearing lubrication	Full pressure
Lube oil pumps	Main oil, piston cooling, scavenging engine driven, positive displacement, helical gear type
Engine overspeed trip	Centrifugal—Independent of Governor
Governor	Woodward*
Fuel supply pump	Positive displacement, engine driven
Fuel injectors	GM unit injectors—needle valve
Engine starting	Air motor*
Engine cooling water pumps	Engine driven—centrifugal
Crankpin diameter	6 1/2 inches (165.10 mm)
Piston pin diameter	3.68 inches (93.47 mm)
Rotation facing the flywheel	Counterclockwise*

\*Options Available

## Data Applicable to Specific Engine Series

	645 Series Engines	710 Series Engines
Bore x stroke	9 1/8 x 10 inches (230.19 x 254.00 mm)	9 1/8 x 11 inches (230.19 x 279.40 mm)
Displacement per cylinder	645 cubic inches (10.57 liters)	710 cubic inches (11.64 liters)
Piston speed	1250 ft/min (381 m/min) at 750 rpm 1500 ft/min (457.2 m/min) at 900 rpm	1375 ft/min (419 m/min) at 750 rpm 1650 ft/min (503 m/min) at 900 rpm
Crankshaft main bearing diameter	7 1/2 inches (190.5 mm)	8 1/2 inches (215.9 mm)

## Data Applicable to Specific Engine Model Numbers

	Roots Blower		
Engine Model	8-645E	12-645E	16-645E
Number of Cylinders	8	12	16
Compression Ratio	18:1	18:1	18:1
BMEP @ 900 RPM (PSI)	90	85	90
Number of Main Bearings	5	7	10
Number of Engine Blowers	1	2	2
Type	Roots Type-Helical Lobes	Roots Type-Helical Lobes	Roots Type-Helical Lobes
Driven by	Engine Gears	Engine Gears	Engine Gears <sup>1</sup>

	Turbocharged							
Engine Model <sup>1</sup>	8-645FB	12-645FB	16-645FB	20-645FB	8-710GB	12-710GB	16-710GB	20-710GB
Number of Cylinders	8	12	16	20	8	12	16	20
Compression Ratio	16:1	16:1	16:1	16:1	16:1	16:1	16:1	16:1
BMEP @ 900 RPM (PSI)	130	145	145	136	155	155	155	155
Number of Main Bearings	5	7	10	12	5	7	10	12
Number of Turbochargers	1	1	1	1	1	1	1	1
Type	*	*	*	*	*	*	*	*
Driven by	+	+	+	+	+	+	+	+

\*Centrifugal Flow

+Exhaust Gas and/or Engine Gears Through an Over-Running Clutch

# Marine Propulsion and Generating Units

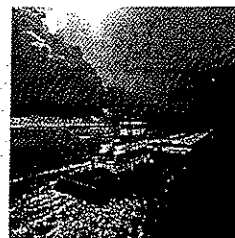
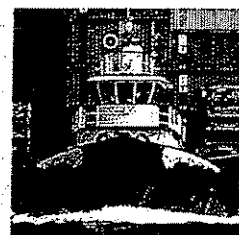
## Marine Equipment Sets (ME) for Marine Propulsion Units (ABS Ratings)\*

Marine Drive Model No.	Engine Model	800 RPM Ratings		900 RPM Ratings	
		Engine BHP	Engine kW	Engine BHP	Engine kW
Roots Blown					
ME8E6	8-645E6	-	-	1050	785
ME12E6	12-645E6	-	-	1500	1120
ME16E6	16-645E6	-	-	2100	1565
Turbocharged					
ME8F7B	8-645F7B	1525	1137	1700	1265
ME12F7B	12-645F7B	2305	1720	2550	1900
ME16F7B	16-645F7B	3150	2349	3505	2610
ME20F7B	20-645F7B	3600	2685	4000	2985
ME8G7B	8-710G7B	1760	1310	2000	1500
ME12G7B	12-710G7B	2625	1960	3000	2240
ME16G7B	16-710G7B	3525	2628	4000	2985
ME20G7B	20-710G7B	4400	3310	5000	3730

## Marine Equipment Sets (ME) for Generator Set Units (ABS Ratings)\*

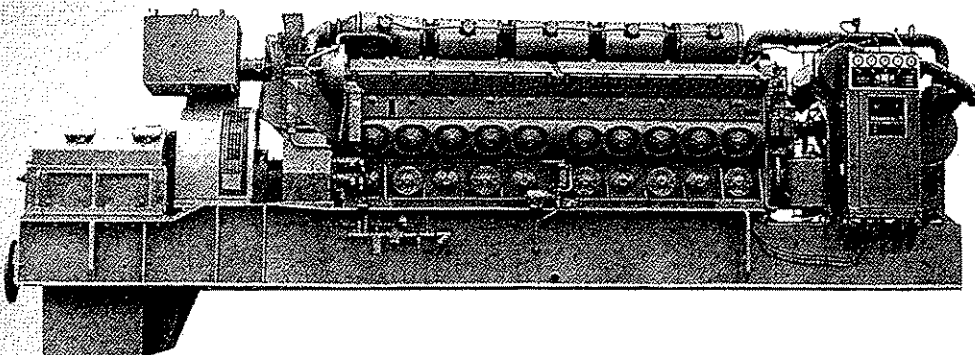
Generator Set Model No.	Engine Model	Continuous Output	Continuous Output
		60 Hz-900 RPM	50 Hz-750 RPM
Roots Blown			
ME8E6	8-645E6	745 kW	570 kW
ME12E6	12-645E6	1075 kW	865 kW
ME16E6	16-645E6	1500 kW	1210 kW
Turbocharged			
ME8F7B	8-645F7B	1210 kW	1010 kW
ME12F7B	12-645F7B	1825 kW	1530 kW
ME16F7B	16-645F7B	2500 kW	2100 kW
ME20F7B	20-645F7B	2865 kW	2580 kW
ME8G7B	8-710G7B	1440 kW	1200 kW
ME12G7B	12-710G7B	2150 kW	1790 kW
ME16G7B	16-710G7B	2865 kW	2385 kW
ME20G7B	20-710G7B	3580 kW	2980 kW

\* Subbase, controls and customized final assembly furnished by EMD authorized Power Products Distributors worldwide.



A complete line of GM/EMD engines is available to meet requirements for marine propulsion and marine generator set applications. A complete power package with engine, reverse-reduction gear or generator and accessories is available through EMD Power Products Distributors. The propulsion units are also available without skid mounting for direct application to the vessel structure.

Electro-Motive marine propulsion drives are also available with two, three or four engines driving a common reverse-reduction gear. A straight-reduction gear is available when controllable pitch propellers are required.



**DATA SHEET**  
**M/V KLIHYAM O.N. 1084928**  
**3900 HP TWIN SCREW TUG**  
**WITH FIXED NOZZLES AND QUAD RUDDERS**

The vessel is a double chine, welded steel, twin screw tugboat. The vessel has seven transverse air tight and water tight bulkheads below main deck. Designed and built in accordance with ABS rules for ocean towing service. The vessel carries a USCG load line with a summer free board assignment of 3' - 5/16".

The vessel was completed in 2004 by Southern Oregon Marine of Coos Bay, OR.

**PRINCIPLE CHARACTERISTICS**

Length (reg)	- 114' - 9 1/2"	Net Tons	- 134	ITC 145
Length (oa)	- 121' - 0"	Gross Tons	- 197.0	ITC 485
Breadth (mld)	- 34' - 0"	F.O. Capacity	- 120,000 gal	
Depth (mld)	- 19' - 10"	F.W. Capacity	- 10,000 gal	
Draft (max)	- 18' - 0"	L.O. Capacity	- 2500 gal	
Displ (SLL)	- 998 L. T.	Bollard Pull	- 120,000 lbs.	

**MACHINERY**

Main Engine	- (2) EMD 16-645-E6; 1950 HP @ 900 rpm
Rev/Red Gear	- (2) Reintjes hydraulic Model WAF 1961 5:1:1 ratio
Prop Shafts	- 12" dia with oil lub bearings
Propellers	- 3 blade R/L outbd turning 114" x 112" in nozzles
Aux Gen sets	- John Deere 99 kw each @ 1800 rpm 480v

**DECK MACHINERY**

Tow Winch	- Intercon Model 225 double drum and gypsy with capstan
Wire Capacity	- (2) 2600' 2 1/4" dia W.R.
Line Pull	- 120,000 lbs. at 25 to 200 fpm
Power	- John Deere 6068TA w/ Funk series 2000 tq converter and 3 speed trans.
Bow Winch	- McElroy Model 528 (1 1/8" wire) w/ 2 capstans

**MISCELLANEOUS**

Propulsion Controls	- (4) station Mathers air controls
Air Compressors	- (2) Quincy model 340 10 HP
Steering	- (2) full redundant systems each with (2) 20 HP Motors
Alarm System	- Harris all functions
Air Conditioning	- Climate control all spaces
Fenders	- Bow pud; D-rubber side fenders
Tow Pins	- 5 pin SOMAR hydraulic

**SAFETY & NAVIGATION OUTFIT CALL SIGN**

Radar	- (3) Furuno long and short
Radio	- (2) VHF's (2) SSB
GPS	- Furuno RD 30
Fathometer	- Data marine sounder
Life Raft	- 10 man inflatable Elliot
Auto Pilot	- Comnav 5000
Satellite Compass	- Furuno SC 120